XI.—Numerous experiments have been made with all kinds of wood, even with hard oak. In the preparation of oak railway ties it was discovered that pieces subjected to a temperature of 212° F. in a bath of heavy tar oil for 4 hours lost from 6 to 7 per cent of their weight, represented by water and albuminous substances, and that they absorbed in heavy oil and zinc chloride enough to represent an increase of from 2 to 3 per cent on their natural original weight. The oak wood in question had been cut for more than a year and was of a density of 1.04 to 1.07.

This system offers the advantage of allowing the absorption of antiseptic liquids without any deformation of the constituent elements of the wood, the more as the operation is performed altogether in open vessels. Another advantage is the greater resistance of the wood to warping and bending, and to the extraction of metallic pieces, such as nails, cramp irons, etc.

XII.—In the Kyanizing process seasoned timber is soaked in a solution of bichloride of mercury (corrosive sublimate) which coagulates the albumen. The solution is very poisonous and corrodes iron and steel, hence is unsuited for structural purposes in which metallic fastenings are used. The process is effective, but dangerous to the health of the workers employed.

XIII.—The Wellhouse process also uses zinc chloride, but adds a small percentage of glue. After the timber has been treated under pressure the zinc chloride solution is drawn off and one of tannin is substituted. The tannin combines with the glue and forms an insoluble substance that effectually seals the pores.

XIV.—The Allardyce process makes use of zinc chloride and dead oil of tar, the latter being applied last, and the manner of application being essentially the same for both as explained in the other processes.

XV.—The timber is boiled in a solution of copper, iron, and aluminum sulphate, to which a small quantity of kainit is added.

XVI.—In the creo-rosinate process the timber is first subjected to a steaming process at 200° F. to evaporate the moisture in the cells; the temperature is then gradually increased to 320° F. and a pressure of 80 pounds per square inch. The pressure is slowly reduced to 26 inches vacuum, and then a solution of dead oil of tar, melted rosin, and formaldehyde is injected. After this process the timber is placed in another cylinder where a solution of milk of lime is applied at a temperature of 150° F. and a pressure of 200 pounds per square inch.

XVII.—The vulcanizing process of treating timber consists essentially in subjecting it to a baking process in hot air which is heated to a temperature of about 500° F. by passing over steam coils. The heat coagulates the albumen, expels the water from the cells, kills the organisms therein, and seals the cells by transforming the sap into a preservative compound. This method is used with success by the elevated railway systems of several cities.

XVIII.—A durable coating for wood is obtained by extracting petroleum asphalt, with light petroleum, benzine, or gasoline. For this purpose the asphalt, coarsely powdered, is digested for 1 to 2 days with benzine in well-closed vessels, at a moderately warm spot. Petroleum asphalt results when the distillation of petroleum continued until a glossy, firm, pulverizable mass of conchoidal fracture and resembling colophony in consistency remains. The benzine dissolves from this asphalt only a yellowish-brown dyestuff, which deeply enters the wood and protects it from the action of the weather, worms, dry rot, etc. The paint is not opaque, hence the wood retains its natural fiber. It is very pleasant to look at, because the wood treated with it keeps its natural appearance. The wood can be washed off with soap, and is especially suited for country and summer houses.

XIX.—A liquid to preserve wood from mold and dry rot which destroys the albuminous matter of the wood and the organisms which feed on it, so there are neither germs nor food for them if there were any, is sold under the name of carbolineum. The specific gravity of a carbolineum should exceed 1.105, and should give the wood a fine brown color. It should, too, be perfectly waterproof. The three following recipes can be absolutely relied on: *a*. Heat together and mix thoroughly 95 pounds of coal-tar oil and 5 pounds of asphalt from coal tar. *b*. Amalgamate together 30 pounds of heavy coal-tar oil, 60 pounds of crude wood-tar oil, and 25 pounds of heavy rosin oil. *c*. Mix thoroughly 3 pounds of asphalt, 25 pounds of heavy coal-tar oil, and 40 pounds of heavy rosin oil.

XX.—Often the wooden portions of machines are so damaged by dampness prevailing in the shops that the follow-

ing compound will be found useful for their protection: Melt 375 parts of colophony in an iron vessel, and add 10,000 parts of tar, and 500 parts of sulphur. Color with brown ocher or any other coloring matter diluted with linseed oil. Make a first light application of this mixture while warm, and after drying apply a second coat.

XXI.—For enameling vats, etc., 1,000 parts of brown shellac and 125 parts of colophony are melted in a spacious kettle. After the mass has cooled somewhat, but is still thinly liquid, 6.1 parts of alcohol (90 per cent) is gradually added. In order to prevent the ignition of the spirit vapor, the admixture of spirit is made at a distance from the stove. By this addition the shellac swells up into a semi-liquid mass, and a larger amount of enamel is obtained than by dissolving it cold. The enamel may be used for wood or iron.

The wood must be well dried; only then will the enamel penetrate into the pores. Two or three coats suffice to close up the pores of the wood thoroughly and to render the surface smooth and glossy. Each coating will harden perfectly in several hours. The covering endures a heat of 140° to 150° F. without injury. This glaze can also be mixed with earth colors. Drying quickly and being tasteless, its applications are manifold. Mixed with ocher, for instance, it gives an elegant and durable floor varnish, which may safely be washed off with weak soda solution. If it is not essential that the objects be provided with a smooth and glossy coating, only a preservation being aimed at the following coat is recommended by the same source: Thin, soluble glass (water glass) as it is found in commerce, with about 24 per cent of water, and paint the dry vessel rather hot with this solution. When this has been absorbed, repeat the application, allow to dry, and coat with a solution of about 1 part of sodium bicarbonate in 8 parts of water. In this coating silicic acid is separated by the carbonic acid of the bicarbonate; from the water glass (sodium silicate) absorbed by the pores of the wood, which, as it were, silicifies the wooden surfaces, rendering them resistive against the penetration of liquids. The advantages claimed for both processes are increased durability and facilitated cleaning.

XXII.—Tar paints, called also mineral or metallic paints, are sold in barrels or boxes, at varying prices. Some dealers color them—yellow ocher, red ocher, brown, gray, etc. They are prepared by mixing equal parts of coal tar and oil of turpentine or mineral essence (gasoline). The product, if it is not colored artificially, is of a brilliant black, even when cold. It dries in a few hours, especially when prepared with oil of turpentine. The paints with mineral essence are, however, generally preferred, on account of their lower cost. Either should be spread on with a hard brush, in coats as thin as possible. They penetrate soft woods, and even semi-hard woods sufficiently deep, and preserve them completely. They adhere perfectly to metals. Their employment can, therefore, be confidently advised, so far as concerns the preservation directly of iron cables, reservoirs, the interior surface of generators, etc. However, it has been shown that atmospheric influence or variations of temperature cause the formation of ammoniacal solutions, which corrode the metals. Several companies for the care and insurance of steam engines have for some time recommended the abandonment of tar products for applications of this kind and the substitution of hot linseed oil.

XXIII.—Coal-tar paints are prepared according to various formulas. One in current use has coal tar for a base, with the addition of gum rosin. It is very black. Two thin coats give a fine brilliancy. It is employed on metals, iron, sheet iron, etc., as well as on wood. It dries much quicker than the tars used separately. Its preserving influence against rust is very strong.

The following Tissandier formula has afforded excellent results. Its facility of preparation and its low cost are among its advantages. Mix 10 parts of coal tar, 1 to 1.6 parts of slaked lime, 4,000 parts of oil of turpentine, and 400 parts of strong vinegar, in which $\frac{1}{8}$ part of cupric sulphate has been previously boiled. The addition of 2 or 3 cloves of garlic in the solution of cupric sulphate aids in producing a varnish, brilliant as well as permanent. The compound can be colored like ordinary paints.

XXIV. — Rectified rosinous oil for painting must not be confounded with oils used in the preparation of lubricants for metallic surfaces exposed to friction. It contains a certain quantity of rosin in solution, which, on drying, fills the pores of the wood completely, and prevents decomposition from the action of various saprophytic fungi. It is well adapted to the preservation of pieces to be buried in the ground or exposed to the inclemency

of the weather. Paints can also be prepared with it by the addition of coloring powders, yellow, brown, red, green, blue, etc., in the proportion of 1 kilo to 5 liters of oil. The addition ought to take place slowly, while shaking, in order to obtain quite a homogeneous mixture. Paints of this kind are economical, in consequence of the low price of rosin, but they cannot be used in the interior of dwellings by reason of the strong and disagreeable odor disengaged, even a long time after their application. As an offset, they can be used like tar and carbonyl, for stalls, stables, etc.

To Prevent Warping.—Immerse the wood to be worked upon in a concentrated solution of sea salt for a week or so. The wood thus prepared, after having been worked upon, will resist all changes of temperature.

STAINS FOR WOOD.

In the staining of wood it is not enough to know merely how to prepare and how to apply the various staining solutions; a rational exercise of the art of wood staining demands rather a certain acquaintance with the varieties of wood to be operated upon, a knowledge of their separate relations to the individual stains themselves; for with one and the same stain very different effects are obtained when applied to the varying species of wood.

Such a diversity of effects arises from the varying chemical composition of wood. No unimportant rôle is played by the presence in greater or lesser quantities of tannin, which acts chemically upon many of the stains and forms with them various colored varnishes in the fibers. Two examples will suffice to make this clear. (1) Let us take pine or fir, in which but little of the tanning principle is found, and stain it with a solution of 50 parts of potassium chromate in 1,000 parts of pure water; the result will be a plain pale yellow color, corresponding with the potassium chromate, which is not fast and as a consequence is of no value. If, with the same solution, on the contrary, we stain oak, in which the tanning principle is very abundant, we obtain a beautiful yellowish-brown color which is capable of withstanding the effects of both light and air for some time; for the tannin of the oak combines with the penetrating potassium chromate to form a brown dyestuff which deposits in the woody cells. A similar procedure occurs in the staining of mahogany and walnut with the chromate because these varieties of wood are very rich in tannin.

(2) Take some of the same pine or fir and stain it with a solution of 20 parts of sulphate of iron in 1,000 parts of water and there will be no perceptible color. Apply this stain, however, to the oak and we get a beautiful light gray, and if the stain be painted with a brush on the smoother oaken board, in a short time a strong bluish-gray tint will appear. This effect of the stain is the result of the combination of the green vitriol with the tannin; the more tannin present, the darker the stain becomes. The hardness or density of the wood, too, exerts a marked influence upon the resulting stain. In a soft wood, having large pores, the stain not only sinks further in, but much more of it is required than in a hard dense wood; hence in the first place a stronger, greasier stain will be obtained with the same solution than in the latter.

From this we learn that in soft woods it is more advisable to use a thinner stain to arrive at a certain tone; while the solution may be made thicker or stronger for hard woods.

The same formula or the same staining solution cannot be relied upon to give the same results at all times even when applied to the same kinds of wood. A greater or lesser amount of rosin or sap in the wood at the time the tree is felled, will offer more or less resistance to the permeating tendencies of the stain, so that the color may be at one time much lighter, at another darker. Much after the same manner we find that the amount of the tanning principle is not always equal in the same species of wood.

Here much depends upon the age of the tree as well as upon the climatic conditions surrounding the place where it grew. Moreover, the fundamental color of the wood itself may vary greatly in examples of the same species and thus, particularly in light, delicate shades, cause an important delay in the realization of the final color tone. Because of this diversification, not only in the different species of wood, but even in separate specimens of the same species, it is almost impossible always, and at the first attempt, to match a certain predetermined color.

It is desirable that trials at staining should first be made upon pieces of board from the same wood as the object to be stained; the results of such experiments furnishing exact data concerning the strength and composition of the stain to be employed for the exact reproduction of a prescribed color.

Many cases occur in which the color tone obtained by staining cannot always be judged directly after applying the stain. Especially is this the case when stain is employed which slowly develops under the action of the air or when the dyestuff penetrates only slowly into the pores of the wood. In such cases the effect of the staining may only be fully and completely appreciated after the lapse of 24 or 48 hours.

Wood that has been stained should always be allowed 24 or 48 hours to dry in ordinary temperatures, before a coat of varnish, polish, or wax is applied. If any dampness be left in the wood this will make itself apparent upon the varnish or polish. It will become dull, lose its glossy appearance, and exhibit white spots which can only be removed with difficulty. If a certain effect demand the application of two or more stains one upon the other, this may only be done by affording each distinct coat time to dry, which requires at least 24 hours.

Not all the dyes, which are applicable to wood staining, can be profitably used together, either when separately applied or mixed. This injunction is to be carefully noted in the application of coal tar or aniline colors.

Among the aniline dyes suitable for staining woods are two groups—the so-called acid dyes and the basic dyes. If a solution of an acid dye be mixed with a basic dye the effect of their antagonistic dispositions is shown in the clouding up of the stain, a fine precipitate is visible and often a rosin-like separation is noticeable.

It is needless to say that such a staining solution is useless for any practical purpose. It cannot penetrate the wood fibers and would present but an unseemly and for the most part a flaky appearance. In preparing the stains it is therefore of the greatest importance that they remain lastingly clear. It would be considerably of advantage, before mixing aniline solutions of which the acid or basic characteristics are unknown, to make a test on a small scale in a champagne glass and after standing a short time carefully examine the solution. If it has become cloudy or wanting in transparency it is a sign that a separation of the coloring matter has taken place.

The mixing of acid or basic dyestuffs even in dry powdered form is attended with the same disadvantages as in the state of solubility, for just as soon as they are dissolved in water the reactions commence and the natural process of precipitation takes place with all its attending disagreeable consequences.

COLOR STAINS:

Bronze.—I.—Prepare first a thin glue size by soaking good animal glue over night in cold water and melting it next morning in the usual water bath. Strain it, before using, through old linen or cheese cloth into a clean vessel. Sandpaper smooth and dust the articles, then apply with a soft bristle brush 2 or 3 coats of the size, allowing sufficient time for each coat to harden before applying the next. Now, a ground coat made by thoroughly mixing finely bolted gilders' whiting and glue size is applied, and when this has become hard it is rubbed to a smooth, even surface with selected fine pumice, and then given 1 coat of thin copal varnish. When this is nearly but not quite dry, the bronze powder is applied with a suitable brush or wad of cotton, and when dry the surplus bronze is removed with the same tool. If collected on clean paper, the dusted-off bronze powder may be used again.

II.—Diluted water-glass solution makes a good ground for bronze. Bronze powder is sprinkled on from a wide-necked glass tied up with gauze, and the excess removed by gently knocking. The bronze powder adheres so firmly after drying that a polish may be put on by means of an agate. The process is especially useful for repairing worn-off picture frames, book ornamentations, etc. The following bronze ground also yields good results: Boil 11,000 parts of linseed oil with 25 parts of impure zinc carbonate, 100 parts of red lead, 25 parts of litharge, and 0.3 parts of mercuric chloride, until a drop taken out will stand like a pea upon a glass surface. Before complete cooling, the mass is diluted with oil of turpentine to a thick syrup.

Ebony Stains.—I.—To 1 pint of boiling water add ¾ ounce of copperas and 1 ounce logwood chips. Apply this to the wood hot. When the surface has dried thoroughly wet it with a solution composed of 7 ounces steel filings dissolved in ¼ pint of vinegar.

II.—Give the wood several applications of a stout decoction of logwood chips, finishing off with a free smear of vinegar in which rusty nails have been for some time submerged.

III.—In 1 quart of water boil ¼ pound of logwood chips, subsequently adding ½ ounce pearl ash, applying the mixture

hot. Then again boil the same quantity of logwood in the same quantity of water, adding ¼ ounce of verdigris and ¼ ounce of copperas, after which strain and put in ¼ pound of rusty steel filings. With this latter mixture coat the work, and, should the wood not be sufficiently black, repeat the application.

Metallic Luster.—A valuable process to impart the luster of metal to ordinary wood, without injuring its natural qualities, is as follows: The wood is laid, according to its weight, for 3 or 4 days in a caustic alkaline solution, such as, for instance, of calcined soda, at a temperature of 170° F. Then it is at once placed in a bath of calcium hydrosulphite, to which, after 24 to 36 hours, a saturated solution of sulphur in caustic potash is added. In this mixture the wood is left for 48 hours at 100° to 120° F. The wood thus prepared, after having been dried at a moderate temperature, is polished by means of a smoothing iron, and the surface assumes a very handsome metallic luster. The effect of this metallic gloss is still more pleasing if the wood is rubbed with a piece of lead, zinc, or tin. If it is subsequently polished with a burnisher of glass of porcelain, the wood gains the brilliancy of a metallic mirror.

Nutwood.—One part permanganate of potassium is dissolved in 30 parts clear water; with this the wood to be stained is coated twice. After an action of 5 minutes, rinse off with water, dry, oil, and polish. It is best to prepare a fresh solution each time.

Oak.—I.—Water-color stains do not penetrate deep enough into wood to make the effect strong enough, hence solutions of other material than color are being employed for the purpose. Aqua ammonia alone, applied with a rag or brush repeatedly, will darken the color of oak to a weathered effect, but it is not very desirable, because of its tendency to raise the grain. Bichromate of potash, dissolved in cold water, applied in a like manner, until the desired depth is obtained, will serve the purpose. These washes or solutions, however, do not give the dark, almost black, effect that is at the present time expected for weathered oak, and in order to produce this, 4 ounces of logwood chips and 3 ounces of green copperas should be boiled together in 2 quarts of water for 40 minutes and the solution applied hot. When this has dried it should be gone over with a wash made from 4 ounces steel filings and 1 pint of strong vinegar. The steel filings are previously put into the vinegar and allowed to stand for several days. This will penetrate into the wood deeply, and the stain will be permanent. Picture-frame manufacturers use a quick-drying stain, made from aniline blacks.

II.—Dissolve ¼ part of permanganate of potassium in 1,000 parts of cold water and paint the wood with the violet solution obtained. As soon as the solution comes in contact with the wood it decomposes in consequence of chemical action, and a handsome light-brown precipitate is produced in the wood. The brushes used must be washed out immediately, as the permanganate of potassium destroys animal bristles, but it is preferable to use sponges or brushes of glass threads for staining. Boil 2 parts of cutch in 6 parts of water for 1 hour, stir while boiling, so that the rosiniferous catechu cannot burn on the bottom of the vessel; strain the liquid as soon as the cutch is dissolved, through linen, and bring again to a boil. Now dissolve therein ¼ part of alum, free from iron; apply the stain while hot, and cover after the drying, with a solution of 1 part of bichromate of potassium in 25 parts of water.

Rosewoood.—First procure ½ pound logwood, boiling it in 3 pints water. Continue the boiling until the liquid assumes a very dark color, at which point add 1 ounce salt of tartar. When at the boiling point stain your wood with 2 or 3 coats, but not in quick succession, as the latest coat must be nearly dry before the succeeding one is applied. The use of a fiat graining brush, deftly handled, will produce a very excellent imitation of dark rosewood.

Silver Gray.—This stain is prepared by dissolving 1 part of pyrogallic acid in 25 parts of warm water and the wood is coated with this. Allow this coating to dry and prepare, meanwhile, a solution of 2 parts of green vitriol in 50 parts of boiling water, with which the first coating is covered again to obtain the silver-gray shade.

Walnut.—I.—Prepare a solution of 6 ounces of a solution of permanganate of potassium, and 6 ounces of sulphate of magnesia in 2 quarts of hot water. The solution is applied on the wood with a brush and the application should be repeated once. In contact with the wood the permanganate decomposes, and a handsome, lasting walnut color results. If small pieces of wood are to be thus stained, a very dilute bath is prepared

according to the above description, then the wooden pieces are immersed and left therein from 1 to 5 minutes, according to whether a lighter or darker coloring is desired.

II.—One hundredweight Vandyke brown, ground fine in water, and 28 pounds of soda, dissolved in hot water, are mixed while the solutions are hot in a revolving mixer. The mixture is then dried in sheet-iron trays.

Yellow.—The wood is coated with a hot concentrated solution of picric acid, dried, and polished. (Picric acid is poisonous.)

IMITATION STAINS.

Yellow, green, blue, or gray staining on wood can be easily imitated with a little glazing color in oil or vinegar, which will prove better and more permanent than the staining. If the pores of the wood are opened by a lye or a salt, almost any diluted color can be worked into it. With most stains the surface is thus prepared previously.

Light-Fast Stains.—Stains fast to light are obtained by saturating wood in a vacuum chamber, first with dilute sulphuric acid, then with dilute alkali to neutralize the acid, and finally with a solution with or without the addition of a mordant. The action of the acid is to increase the affinity of the wood for dye very materially. As wood consists largely of cellulose, mercerization, which always increases the affinity of that substance for dyes, may be caused to some extent by the acid.

SPIRIT STAINS:

Black.—

I.—White shellac	12	ounces
Vegetable black	6	ounces
Methylated spirit	3	pints
II.—Lampblack	1	pound
Ground iron scale	5	pounds
Vinegar	1	gallon

Mahogany Brown.—Put into a vessel, say 4 pounds of bichromate of potash, and as many ounces of burnt umber, let it stand a day or two, then strain or lawn for use.

Vandyke Brown.—

Spirit of wine	2	pints
Burnt umber	3	ounces
Vandyke brown color	1	ounce
Carbonate of soda	1	ounce
Potash	½	ounce

Mahogany.—Rub the wood with a solution of nitrous acid, and then apply with a brush the following:

I.—Dragon's blood	1	ounce
Sodium carbonate	6	drachms
Alcohol	20	ounces

Filter just before use.

II.—Rub the wood with a solution of potassium carbonate, 1 drachm to a pint of water, and then apply a dye made by boiling together:

Madder	2	ounces
Logwood chips	½	ounce
Water	1	quart

Maple.—

I.—Pale button lac	3	pounds
Bismarck brown	⅛	ounce
Vandyke brown	½	ounce
Gamboge	4	ounces
Methylated spirit	1	gallon

II.—Use 1 gallon of methylated spirit, 4 ounces gamboge (powdered), ½ ounce Vandyke brown, 1 drachm Bismarck brown, 3 pounds shellac.

Maroon.—To produce a rich maroon or ruby, steep red Janders wood in rectified naphtha and stir into the solution a little cochineal; strain or lawn for use.

Turpentine Stains.—Turpentine stains are chiefly solutions of oil-soluble coal-tar dyes in turpentine oil, with small quantities of wax also in solution. They do not roughen the wood, making a final polishing unnecessary. They enter the wood slowly, so that an even stain, especially on large surfaces, is secured. The disadvantages of turpentine stains are the lack of permanence of the coloring, when exposed to light and air, and their high price.

Varnish Stains.—Shellac is the chief article forming the basis of varnish stains the coloring matter being usually coal tar or aniline dyes, as they give better results than dye wood tincture. To prevent the varnish stain being too brittle, the addition of elemi rosin is a much better one than common rosin, as the latter retards the drying quality, and if too much be used, renders the stain sticky.

Water Stains.—Water stains are solutions of chemicals, dye extracts, astringent substances, and coal-tar dyes in water. They roughen the wood, a disadvantage, however, which can be remedied to a large extent by previous treatment, as follows: The wood is moistened with a wet sponge, allowed to dry,

and then rubbed with sandpaper, or made smooth by other agencies. This almost entirely prevents roughening of the surface by the stain. Another disadvantage of these stains is that they are rapidly absorbed by the wood, which makes an even staining of large surfaces difficult. For this too there is a remedy. The surface of the wood is rubbed all over evenly with raw linseed oil, applied with a woolen cloth, allowed to dry, and then thoroughly smoothed with sandpaper. The water stain, applied with a sponge, now spreads evenly, and is but slightly absorbed by the wood.

Among good water stains are the long-known Cassel brown and nut brown, in granules. Catechine is recommended for brown shades, with tannin or pyrogallic acid and green vitriol for gray. For bright-colored stains the tar-dyes azine green, croceine scarlet, Parisian red, tartrazine, water-soluble nigrosin, walnut, and oak brown are very suitable. With proper mixing of these dyes, all colors except blue and violet can be produced, and prove very fast to light and air, and superior to turpentine stains. Only the blue and violet dyes, methyl blue, naphthol blue, and pure violet, do not come up to the standard, and require a second staining with tannin.

A very simple method of preparing water stains is as follows: Solutions are made of the dyes most used, by dissolving 500 parts of the dye in 10,000 parts of hot water, and these are kept in bottles or casks. Any desired stain can be prepared by mixing proper quantities of the solutions, which can be diluted with water to make lighter stains.

Stains for Wood Attacked by Alkalies or Acids.—

Solution A

Copper sulphate...	125 grams
Potassium chlorate.	125 grams
Water.....	1,000 cu. cm.

Boil until all is dissolved.

Solution B

Aniline hydrochloride.....	150 grams
Water.....	1,000 cu. cm.

Apply Solution A twice by means of a brush, allowing time to dry after each coat; next, put on Solution B and let dry again. On the day following, rub on a little oil with a cloth and repeat this once a month.

SUBSTITUTES FOR WOOD.

I.—The following is a formula for "Plastic Wood." It can be used for filling crevices and holes and for repairing wood work and as a general substitute for wood.

Wood flour	100	ounces
Castor oil	½	fluidounce
Acetone	½	fluidounce
Powdered rosin ..	½	ounce
Alcohol	½	fluidounce

Mix the two powdered ingredients and then add a mixture of the liquids. Knead till uniform.

II.—"Carton Pierre" is the name of a mass which is used as a substitute for carved wood. It is prepared in the following manner: Glue is dissolved and boiled; to this, tissue paper in suitable quantity is added, which will readily go to pieces. Then linseed oil is added, and finally chalk is stirred in. The hot mass forms a thick dough which crumbles in the cold, but softens between the fingers and becomes kneadable, so that it can be pressed into molds (of glue, gypsum, and sulphur). After a few days the mass will become dry and almost as hard as stone. The paper imparts to it a high degree of firmness, and it is less apt to be injured than wood. It binds well and readily adheres to wood.

III.—Wood Pulp.—The boards for painters' utensils are manufactured in the following manner: The ordinary wood fiber (not the chemical wood cellulose) is well mixed with soluble glass of 33° Bé., then spread like cake upon an even surface, and beaten or rolled until smooth. Before completely dry, the cake is removed, faintly satined (for various other purposes it is embossed) and finally dried thoroughly at a temperature of about 133° F., whereupon the mass may be sawed, carved, polished, etc., like wood.

Any desired wood color can be obtained by the admixture of the corresponding pulverized pigment to the mass. The wood veining is produced by placing a board of the species of timber to be imitated, in vinegar, which causes the soft parts of the wood to deepen, and making an impression with the original board thus treated upon the wood pulp when the latter is not quite hard. By means of one of these original boards (with the veins embossed), impressions can be made upon a large number of artificial wood plates. The veins will show to a greater advantage if the artificial wood is subsequently saturated and treated with colored oil, colored stain and colored polish, as is done with palettes.

WOOD, CHLORINE-PROOFING:
See Acid-Proofing.

WOOD, FIREPROOFING:
See Fireproofing.

WOOD GILDING:
See Plating.

WOOD, IMITATION:
See Plaster.

WOOD POLISHES:
See Polishes.

WRITING UNDER THE SHELL OF AN EGG:

Dissolve one ounce of alum in a half pint of vinegar with a small pointed brush outline whatever writing you desire on the shell of the egg with the above solution. After the solution has dried thoroughly on the egg, boil it for about 15 minutes. If these directions are carried out all tracings of the writing will have disappeared from the outside of the shell—but when the shell is cracked open the writing will plainly show on the white of the egg.

WRITING, RESTORING FADED:

Writing on old manuscripts, parchments, and old letters that has faded into nearly or complete invisibility can be restored by rubbing over it a solution of ammonium sulphide, hydrogen sulphide or of "liver of sulphur." On parchment the restored color is fairly permanent but on paper it does not last long. The letters however could be easily retraced, after such treatment, by the use of India ink and thus made permanent. This treatment will not restore faded aniline ink. It only works with ink containing a metal-like iron that forms a black sulphide.

WRINKLES, REMOVAL OF:
See Cosmetics.

Yeast

DRY YEAST.

Boil together for ½ hour, 95 parts of the finest, grated hops and 4,000 parts of water. Strain. Add to the warm liquor 1,750 parts of rye meal or flour. When the temperature has fallen to that of the room add 167 parts of good yeast. On the following day the mass will be in a state of fermentation. While it is in this condition add 4,000 parts of barley flour, so as to form a dough. This dough is cut up into thin disks, which are dried as rapidly as possible in the open air or sun. For use, the disks are broken into small pieces and soaked overnight in warm water. The yeast can be used on the following day as if it were ordinary brewers' yeast.

PRESERVATION OF YEAST.

I.—The yeast is laid in a vessel of cold water which is thereupon placed in a well-ventilated, cool spot. In this manner the yeast can be preserved for several weeks. In order to preserve the yeast for several months a different process must be followed. The yeast, after having been pressed, is thoroughly dried. For this purpose the yeast is cut up into small pieces which are rolled out, placed on blotting paper, and allowed to dry in a place which is not reached by the sun. These rolls are then grated, again dried. and finally placed in glass bottles. For use, the yeast is dissolved, whereupon it immediately regains its freshness. This process is particularly to be recommended because it preserves the yeast for a long period.

II.—For liquid yeast add one-eighth of its volume in glycerine. In the case of compressed yeast, the cakes are to be covered with glycerine and kept in closed vessels. Another method of preserving compressed yeast is to mix it intimately with animal charcoal to a dough, which is to be dried by exposure to sunlight. When it is to be used, it is treated with water, which will take up the ferment matter, while the charcoal will be deposited. Liquid and compressed yeast have been kept for a considerable time, without alteration, by saturating the former with chloroform and keeping the latter under chloroform water.

YEAST TESTS.

I.—Pour a few drops of yeast into boiling water. If the yeast sinks, it is spoiled; if it floats, it is good.

II.—To 1 pound yeast add ½ tablespoonful of corn whisky or brandy, a pinch of sugar, and 2 tablespoonfuls of wheat flour. Mix thoroughly and allow the resultant compound to stand in a warm place. If the yeast is good it will rise in about an hour.

YEAST AND FERTILIZERS:
See Fertilizers.

YELLOW (CHROME), TEST FOR:
See Pigments.

RECENT DEVELOPMENTS NOT CLASSIFIED ELSEWHERE

ACID-PROOF COATINGS:

Chlorinated Rubber.—"Tornesit" may be dissolved in such solvents as toluol or high-flash naphtha to give coatings which are highly resistant to corrosion, acids and alkalies.

Following is a formula:

Chlorinated rubber ...	20 parts
Toluol	80 parts
Tung oil	5 parts
Pigment	10 parts

AGRICULTURAL INSECTICIDES:

Bordeaux Mixture.—This is a good all-round fungicide, however it will stain whatever it comes in contact with a blue-green color. Wooden or earthen containers should be used in mixing; metal containers should be avoided. The following formula is recommended for summer spraying:

Copper sulfate	2½ ounces
Lime (unslaked) .	2½ ounces
Water to make	2 gallons

Mix the copper sulfate with almost half the water, dissolve thoroughly. Slake the lime with a little water to make a smooth paste. Next, add most of the remaining water to the paste, making a uniform solution of milk of lime. Pour these two solutions at the same time into a vessel containing the rest of the water, thoroughly stir and strain. After being made, the mixture should be used promptly. For good adherence, an ounce of any good mild soap for each gallon of mixture should be dissolved in a little hot water and added.

Lime-Sulfur Spray.—The following formula is recommended by the Oregon Agricultural Experiment Station:

Quicklime	55 pounds
Sulfur (powdered or finely ground) ...	100 pounds
Water	50 gallons

Add the lime to the water and heat just below the boiling point, then add sulfur and boil for 45 minutes—stir continuously. Add hot water to compensate for the loss by evaporation. After cooling and settling, the clear liquid may be drawn off. Care should be taken to prevent the solution from coming in contact with the skin, clothing or buildings. The caustic action of the mixture should be remembered at all times.

AUTOMOBILE CLEANER:

An effective automobile cleaner may be prepared as follows:

Naphtha	65 parts
Bentonite	15 parts
Triethanolamine	3 parts
Beeswax	8 parts
Ceresin	8 parts
Water	65 parts
Stearic acid	7 parts

The stearic acid, triethanolamine and water are mixed and heated to 212° F., stirring to attain smooth solution. The waxes are melted in the Naphtha which is then added to the soap solution. Stir thoroughly until a smooth emulsion is obtained then add the Bentonite and continue stirring until a creamy paste results.

BATH SALTS:

Sodium sesqui-carbonate crystals are used, which may be colored with Auramine to give yellow, with Croceine-pink, with Alpha Zurine-blue, with Alizarine-Geranole-orchid and with Methyl Violet —violet. Colors fast to alkali must be used. Perfume may be added.

I.—Crystal ..... 100 pounds
Dye .....⅔ oz per gallon

Distribute the dye over the crystals preferably in a rotary or similar mixer. Spread out the crystals and allow to dry before packing.

II.—A few pounds of magnesium or sodium sulfate may be added to the above.

BLEACHING:

Hemp.—If a rough bleach is desired the hemp is first boiled for a half hour in a solution of 1 part silicate of soda at 70° Tw. to 200 parts of water. The hemp is then removed and boiled in water alone; then rinsed and steeped for 24 hours in solution of 1 part bleaching powder to 600 parts of water. After draining, the material is soured in hydrochloric acid (1 part commercial acid to 1000 parts water). Next, the hemp is washed thoroughly and dried. A still whiter color may be obtained by repeating the process.

Silk.—A method for bleaching silk which is considered to be superior to many others is the following:—the silk is immersed overnight in a solution containing:

Hydrogen peroxide (12 vols.)	2	gallons
Sodium Silicate ...	¾	pint
White Soap	1	pound
Water	10	gallons

The soap is dissolved in the water before the addition of the other ingredients. The temperature of the bath is kept at 120° F. during the bleach. After removal, the silk is washed lightly—first in a solution of water containing a small percentage of sulfuric acid and then in fresh water.

Wool.—Ebell recommends the following method for bleaching wool:—the wool is dipped into a solution of hydrogen peroxide (3%), to which has been added for every gallon of peroxide .2 gallons of ammonia (sp. gr. .9010). The solution is left at room temperature for 24 hours. By raising the temperature to 86° F. the bleach will proceed more rapidly and will be finished in eight to ten hours.

Although the foregoing process is one of the more expensive, it is often used where a more permanent white is desired.

CASEIN:

Casein Preparation.—Casein occurs in the milk of mammals and it is the principal protein of cow's milk. It is usually obtained from skimmed milk which has been practically freed from all the butter fat by centrifuging or other mechanical means. It may be considered essentially a waste product. On the industrial scale casein is separated from skimmed milk by two processes:

(1) By precipitating by the addition of acids such as hydrochloric, sulfuric, phosphoric, and lactic or by "self-souring," that is by the lactic acid generated by the bacteria on the souring of the milk.

(2) By the addition of rennet. We have therefore two distinct classes of casein, commonly called acid casein and rennet casein.

In one method of precipitating by the addition of acid the highly skimmed milk is warmed to a temperature of 94-96° F. stirring rapidly while adding hydrochloric acid which has been diluted with 8 parts of water. The acidity should have a pH value of 4.1. The whey is then drawn off, the casein washed with water at 94° F. two or three times, pressed and dried at 125 to 130° F.

In precipitating with rennet the milk must be highly skimmed and not sour. The amount of rennet added is usually dependent on its activity, generally 1½ ounces per 100 gallons of milk. The rennet is first dissolved in water and stirred in the milk which has been warmed to a temperature of 95° F. It is then allowed to settle undisturbed after which the precipitated mass is cut up with a special knife, the whey drawn off and the casein pressed, washed and dried. The temperature of the drying must be carefully controlled as overheating causes the casein to become dark. In the manufacture of artificial horn where rennet casein is used, it is essential that the casein should be washed carefully to free it of fat. This may be done by extracting the dried casein with solvents such as benzol.

Rennet casein and acid casein are used for entirely different purposes. Rennet casein usually comes in large granular form and is ground to meet the consumer's requirements.

Rennet casein differs from acid casein in its solubility in alkalies, the acid being readily soluble in hydroxides, carbonates, bicarbonates and sulfites, while rennet is insoluble in carbonates and bicarbonates and only partially in borax and ammonia.

Uses of Casein.—Casein plays an importants part in the manufacture of the following:

Adhesives.—Acid casein is used in large quantities for the manufacture of adhesives for veneers and for paper and cardboard. The following is typical of such an adhesive:

Casein	4½ parts
Ammonia	½ part
Borax	½ part
Water	32 parts

The water containing the borax and ammonia is warmed up to 60° C. and while stirring the casein is added a little at a time until a uniform glue is obtained. A little starch may be added. When using sodium hydroxide or ammonia as solvent the glue is not water-resistant and a little formaldehyde should be added.

Another formula calls for:

Casein	10 parts
Water	40-90 parts
Lime	2 parts

Pharmaceutical and Food.—Casein finds a large employment in the preparation of medical compounds in the form of caseinates of metals such as silver, bismuth, calcium, etc. It is also used for food products; here highly purified acid casein is desired.

Paints and Varnishes.—Preparations from mixtures of casein, lime and ammonia are used for interior coatings. Exterior paints may be prepared by using lime, casein and whiting. A little formaldehyde aids in rendering them more resistant to the weather. Colloidal masses from casein solution with admixtures of a drying oil such as tung oil and a white pigment such as titanium oxide form excellent coatings which are resistant to water and to changes in color.

Paper and Textile Sizes.—Casein is used to a very large extent in the sizing of paper and textiles. The casein for this purpose should be low in fat content, white, and free from any impurities. Casein renders paper much more resistant to tearing, water and even fire. Textiles may be coated with a solution of casein and then hardened by means of formaldehyde which will render them impermeable and give the appearance of artificial leather. Casein is largely used in making varnishes for papers. A varnish may be prepared from the following formula:

Casein	10 parts
Water	80 parts
Ammonia 21° Bé.	2 parts

To the solution 5 parts of glycerine are added and equal volumes of formaldehyde and ammonia.

Plastics.—Large amounts of casein are used in the preparation of Galalith or artificial horn. This material is used daily in large quantities in the manufacture of pencils, buttons, jewelry articles and novelties of all sorts. It comes in transparent effects in all pastels colors and is very tough and easily machined. It is also a substitute for ivory, especially in the manufacture of billiard balls. Rennet casein must be employed in the manufacture of plastics. The casein is plasticized with the addition of plasticizing agents and heat in special extruding presses from whence it is ejected in the form of rods. These rods may be pressed under platens and fused together into sheets. The rods and sheets are then hardened by immersion in a beath of formaldehyde of varying strengths and for periods of time dependent on the size of the rods and sheets. The rods and sheets are then machined into the desired articles. Many variations to the above process are in use but in general the one above is followed. Casein takes a very high polish and may be polished by dipping into a special chemical bath.

"Synthetic Wool".—A discovery of an Italian chemist, is a very recent development which will probably become of tremendous importance to the Textile Industry. The industrial production of this product started less than a year ago (Fall, 1935).

Casein, which is extracted from skim milk of low fat content by chemical means, is subjected to a curing process and then after a number of carefully controlled operations is formed into a solution which is ready for the spinning process. From this point on the process is similar to that of rayon. The viscous solution is next directed through small holes whereby it is converted into "woolen threads." It is then passed through a hardening bath, the fibres are cut, washed and dried.

It is reported that the "synthetic wool" is warm, soft and in general its important properties compare favorably with the natural wool. The inventor claims that due to the small percentage of sulfur present in the synthetic material it possesses greater heat-retaining characteristics than that of natural wool.

One of the few disadvantages of the synthetic product is that its tensile strength is rather low as compared with that of natural wool. However, it appears reasonable to assume that further research will develop this material into an important competitor with natural wool and other products.

Casein finds other uses in insecticides, soaps, pottery, inks, etc.

CHROMIUM PLATING.

Fink's Process, which was put into use about 1924, is the one commonly used. The bath consists of a solution of chromic acid containing an amount of sulfate ion or sulfate radical equal to one per cent of the weight of chromic acid present. The concentration of chromic acid generally ranges from 200 to 500 grams per liter or about 27 to about 67 oz. per gallon. The bath at present recommended by the Bureau of Standards has the same contents.

The two formulas given below are typical of the two types of solution in most common use.

I. Dilute Solution:
Chromic acid—250 grams per liter (33 oz./gal.)
Sulfuric acid—2.5 grams per liter (.33 oz./gal.)

II. Concentrated Solution:
Chromic acid—400 grams per liter (53 oz./gal.)
Sulfuric acid—4 grams per liter (.53 oz./gal.)

Sulfuric acid is specified in the above formulas because it is convenient to use and consists almost entirely of sulfate radical. The quantity of sulfuric acid to be used by volume would be about 1-1/3 cubic centimeters or about 1/25 of a fluid ounce per liter in Formula No. I, and about 2-1/6 cubic centimeters or about 1/15 of a fluid ounce per liter in Formula No. II. Similarly the .33 avoirdupois oz. of sulfuric acid in Formula No. I would be equal to about .17 fluid ounces, and the .53 oz./gal. in Formula No. II, would be about .28 fluid ounces.

Any soluble sulfate of definite composition may be used to provide the sulfate radical but it is then necessary to calculate the quantity to be used which will be equivalent to the sulfuric acid in the above formulas. Thus anhydrous sodium sulfate contains approximately 2/3 of its weight of sulfate radical, and it would be necessary to use 3.6 grams per liter (½ oz./gal.) of it in Formula No. I instead of the sulfuric acid. Likewise 6 grams per liter (.8 oz./gal.) of anhydrous sodium sulfate would be required to replace the sulfuric acid in Formula No. II.

While the sulfate radical concentration given above is very small, its exact concentration is very important and must be carefully maintained. The amount of sulfate radical in the bath should always be maintained so that the proportion between the chromic acid and sulfate radical is approximately 100 to 1. Without the sulfate radical no chromium deposit would be obtained, and if the amount given is exceeded appreciably, no chromium deposit may again be obtained or only a very scanty deposit covering the cathode imperfectly. For this reason it is essential to use very pure chromic acid in making up the bath, or else to ascertain the exact amount of sulfate radical in the chromic acid used by analysis, and deduct this amount from the amount of sulfate radical which is recommended to be added. Some chromic acid contains more sulfate radical than is necessary for chromium plating, and is therefore unsuitable for this purpose and it is impossible to use it.

Both of the baths given are to be used with lead anodes, at a temperature of about 45°C (113°F) and with a cathode current density of about one ampere per square inch (15 amps./sq. dm.). Under these conditions a bright, mirror-like chromium plate is obtained on smooth, polished metal surfaces. The temperature of the bath must be carefully maintained, as if it is allowed to drop to 35°C (95°F) a bright plate would no longer be obtained unless the current were reduced to about half its value, while if it is permitted to rise to 55°C (131°F) no plate might be obtained on some parts of the object, and it would be necessary to practically double the current density to get good results. These last conditions are sometimes used in practice, particularly where it is desired to build up a heavy, hard-wear-resistant plate on such articles as tools, dies, and gages in a short time, but a higher voltage is required. The conditions for obtaining mirror-bright chromium plate may be readily ascertained from Fig. 1. This graph is of necessity only approximate, but it is nevertheless a very valuable guide. At any given temperature of the bath, the best results are obtained by using the current density corresponding to the edge of the bright plate area furthest to the right at this temperature, or a slightly smaller current density. While the bright plate area shown in Fig. 1 is approximately true for both Solution No. I and Solution No. II, the upper right-hand limits apply most closely to Solution No. I and the very lowermost left-hand part of the area is only given

by Solution No. II. It is usually very important to work within the bright plate range as it is very difficult to buff or polish dull chromium plate owing to its extreme hardness.

Formula No. I is generally used for producing thick wear-resistant chromium plate, as under identical conditions it has a slightly higher efficiency than Formula No. II. The efficiency of both solutions is about 10 to 15 per cent under the conditions given, the remainder of the current being consumed in the production of an abundant evolution of hydrogen gas and the reduction of a small amount of chromic acid, which is re-oxidized to chromic acid again at the anode. Formula No. II is most suitable for general use as it has a higher conductivity and can be used with a six volt source of current, while Formula No. I requires a higher voltage unless the electrode spacing is very small. Solution No. II is also somewhat more dependable and flexible than Solution No. I, and requires less care in its operation and maintenance.

As indicated above, the exact composition of these baths is very important and must be maintained by periodic analyses and additions if they are used very much. Otherwise a point may soon be reached where very poor results, or even no deposit, is obtained. If the solutions are operated cold, a heavy dull-grey chromium plate is obtained at efficiencies of the order of 30 to 40 per cent, but no bright plate can be obtained and it is necessary to heat the baths for this purpose.

Lead lined steel tanks are generally used to contain large baths, while glass and earthenware containers are convenient for small baths. Numerous other formulas have been proposed than those given, but the only active constituents are usually the chromic acid and the sulfate radical, if satisfactory results are obtained. Fluorides have been found to give results similar to sulfates, while chlorides give only dull plate and are unstable in the bath, chlorine gas being evolved at the anode. Fused baths have been proposed, as have also baths containing only trivalent chromium salts, but none of these baths have any commercial value.

If it is planned to do chromium plating commercially, it is advisable to consult the companies licensing the use of the process, as chromium plating is patented in many countries.

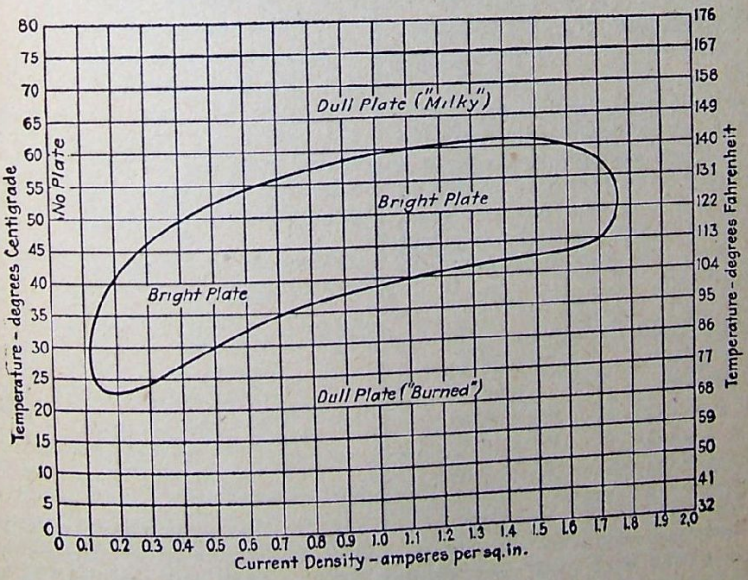

FIG. 1.

LATEST DEVELOPMENTS IN COSMETICS, TOILET AND BEAUTY PREPARATIONS

including creams, lotions, lipsticks, astringents, powders, cologne waters, manicure preparations, hair preparations, dentifrices, breath perfumes.

COLD CREAMS:

A recent French patent for cold cream calls for:

I.—Mineral oil	365	parts
White wax	45	parts
Vegetable wax	90	parts
Borax	11	parts
Water	55	parts

The waxes and oils are melted together on the water bath and a solution of the borax in water is added slowly to it while stirring. The mixture is removed from the bath and stirring continued until the product is cold, smooth and uniform.

To 4 parts by weight of the above mixture 6 parts of a mixture of the following powders is added and the whole worked to a smooth homogeneous cream.

Talc 0000	77	parts
Zinc white	17	parts
Precipitated chalk	63	parts
II.—Stearic acid	15	ounces
Lanolin anhydrous	8	ounces
Spermaceti	10	ounces
Almond oil	16	ounces
Triethanolamine	2	ounces
Geranium oil	to	suit
Water	3	pints

Melt the stearic acid, lanolin and spermaceti in the almond oil and heat to about 70° C. Then add the mixture to a boiling solution of the triethanolamine in water. Stir well and add the perfume, continuing the stirring until the product is uniform. Fill into jars or other containers while warm.

Mentholated Cold Cream.—

White petrolatum	9	ounces
White beeswax	1	ounce
Menthol	60	grains
Camphor	60	grains
Thymol	30	grains
Boric acid	20	grains
Rose water	1	ounce

Melt the beeswax and the petrolatum together on a water bath and when fluid and uniform remove from the bath and add the camphor, menthol and thymol. Stir the whole until thoroughly blended and stir in gradually the rose water in which has been dissolved the boric acid. Work the mixture to a smooth consistency in a mortar or ointment mill and fill into suitable jars.

Lemon Cold Cream.—

White wax	1	pound
White ceresin	4	ounces
Mineral oil (white)	5	pints
Water	2	pints
Borax	1	ounce
Powdered white castile soap	100	grains
Oil of lemon	200	grains
Coloring (vegetable yellow)	enough	to tint.

Melt the wax in the paraffin oil at about 65° C. In another vessel dissolve the borax in the water raised to the same temperature. Pour the aqueous solution in a continuous stream into the oil mixture, stir for a few minutes, add the oil of lemon and coloring and stir well.

CREAMS:

Tan and Sunburn.—

White beeswax	9	ounces
Spermaceti	3	ounces
Oil of almonds	1½	pints
Powdered camphor	3	ounces
Borax	½	ounce
Water	12	fluidounces
Phenylethyl alcohol	15	grains
Oil of neroli synthetic	15	grains
Oil of peach kernels	15	grains

Melt the waxes in the oil of almonds on a water bath till uniform. Remove from the bath and add the camphor stirring till uniform. Then add gradually a hot water solution of the borax and finally add the oils and work till smooth, preferably in an ointment mill.

Vanishing Cream.—

I.—Stearic acid (triple pressed)	5	pounds
Glycerine	1½	pounds
Water	12	pints
Triethanolamine	¼	pound
Phenylacetic acid	6	drops
Benzyl propionate	240	grains
Musk xylene	20	grains
Terpineol	2	ounces

Melt the stearic acid and add it to a boiling solution of triethanolamine in water. Stir and add to it a mixture of the oils in glycerine. Stir until cool.

II.—Stearic acid	4	ounces
Crystalline potassium carbonate	½	ounce
Borax	2	ounces

Glycerine	1	ounce
Water	24	ounces

Add perfume to suit.

The stearic acid is melted on the water bath and while fluid the potassium carbonate and the borax dissolved in the water is added slowly while stirring. Lastly the glycerine is added and the whole is mixed well to smoothness. The product is removed from the water bath and when the temperature has reached 70° C. the desired perfume is added continuing stirring until cold. If desired a portion of the water may be substituted with distilled extract of witch hazel.

Cleansing Cream.—

Stearic acid	30 ounces
White liquid petrolatum	4 pounds
Triethanolamine	4 ounces
Glycerine	5 ounces
Water	6 pints

Blend the acid with the mineral oil, heating to a temperature of about 70° C. and stirring well to a uniform mixture. Then add a boiling solution of the triethanolamine in the water slowly while stirring continually until the whole has emulsified. Remove the heat and add any desired perfume base dissolved in the glycerine continuing to stir slowly until cool and a smooth cream is obtained.

LOTIONS:

Frost Bite Lotion.—

Camphor	55 grains
Salicylic acid	55 grains
Carbolic acid crystals	20 grains
Tannic acid	45 grains
Tincture of benzoin compound	enough to make 4 ounces

Dissolve the acids in the tincture by shaking. Once a day apply to the frosted parts with a camel-hair brush.

Sunburn Lotion.—

Zinc sulphocarbolate	1 ounce
Glycerine	½ ounce
Orange-flower water	8 ounces
Lime water	1 pint

Sponge lotion frequently over ailing skin. It will be found to be cooling, soothing and healing. Shake the bottle well before using.

For Perspiring People.—

Peroxide of hydrogen 3 per cent	7 fluidounces
Glycerine	1 fluidounce
Witch-hazel	14 fluidounces
Orange-flower water	16 fluidounces

Mix all ingredients together and bottle. Shake before using. Apply to body lightly with a sponge each morning and night.

Red Nose.—

Thymol	4 grains
Menthol	5 grains
Alcohol	1 fluidounce
Hydrogen peroxide 3 per cent	4 ounces
Water	10 fluidounces

ASTRINGENTS:

Astringent Lotion.—

Alum	2 ounces
Alcohol	50 ounces
Glycerine	1 ounce
Floral water	40 ounces

Dissolve the alum in the floral water and add to it the glycerine, and finally the alcohol.

Cooling Astringent (for enlarged pores).—

Alum	3 ounces
Menthol	¼ ounce
Eau de Cologne	50 ounces
Water	50 ounces

Dissolve the alum in the water and add to it the solution of menthol in the Eau de Cologne.

Perspiration Deodorants (Foot Powder).—

Talcum	8 ounces
Corn starch	8 ounces
Salicylic acid	120 grains

Thoroughly mix together to a uniform powder.

LIPSTICK:

Paraffin wax	40 ounces
White beeswax	25 ounces
Cocoa butter	10 ounces
White liquid petrolatum	40 ounces
Vanillin	50 grains

Melt the waxes together, add the cocoa butter and the petrolatum and stir to a uniform mass. Remove heat and add while still stirring, the vanillin. Color to desired tint with alkanet and pour into molds.

BLACKSTICK:

For preparing blacksticks use the same formulas as for lipsticks substituting the color with a high grade of mineral black or with black jet nigrosine.

FACE POWDERS:

I.—

Precipitated chalk	10 ounces
Talc	8 ounces
Osmo-kaolin	8 ounces
Magnesium carbonate	8 ounces
Bismuth sub-nitrate	1 ounce
Finely levigated zinc white	2 ounces
Oil of rose	50 grains
Oil of sandalwood	50 grains
Oil of vetiver	20 grains
Color to suit.	

II.—

Talc	15 ounces
Osmo-kaolin	30 ounces
Rice starch	15 ounces
Zinc oxide	6 ounces
Extract carnation pink	1 ounce

Sun Tan Powder.—

Magnesium carbonate	18 parts
Precipitated chalk	18 parts
Golden ochre	60 parts
Pink lake	6 parts

Use 1 pound of the above mixture to 9 pounds of white powder.

Colors for Face Powders.—The following are the more important colors that are used in tinting face powders:

Brunette	Sienna
Rachel	Yellow ochre with some yellow lake
Rose	Carmine
Cream	Same as rachel

COMPACTS:

French chalk	40 ounces
Rice starch	30 ounces
Osmo-kaolin	20 ounces
Zinc carbonate	10 ounces
Binder	25 fluidounces
Carmine	to suit
Perfume	to suit

The binder is made according to the following formula:

Tincture of benzoin	15 fluidounces
Acacia	20 ounces
Water	30 quarts

The acacia gum is soaked in the water till dissolved and then the tincture of benzoin is added and the whole stirred till uniform. This binder is then added to a uniform mixture of the above powders.

COLOGNE WATER (FINEST):

I.—

Bergamot oil	3 fluidounces
Neroli oil (bigarade petale extra)	1 fluidounce
Lemon oil (hand pressed)	2 fluidounces
Lavender oil	½ fluidounce
Petitgrain oil (French)	2 fluidounces
Rosemary oil	1 fluidounce
Bois de rose femmelle	½ fluidounce
Spirit of wine (80 per cent)	12 pints

Dissolve all the oils except the neroli and rosemary in the spirits of wine. Distill and add the neroli and rosemary.

(Second Quality).—

II.—

Bergamot oil	1 fluidounce
Lemon oil	1 fluidounce
Orange oil	1 fluidounce
Oil of neroli (Portugal)	¾ fluidounce
Lavender oil	¼ fluidounce
Oil of cinnamon	¼ fluidounce
Alcohol (90 per cent)	16 pints

Dissolve the oils in the alcohol, allow to stand for one month with frequent shaking and then filter to crystal clearness.

The aromatic oils are usually dissolved in the strong alcohol and if dilution is desired to cheapen the product, orange flower water or rose water is used.

MANICURE PREPARATIONS:

Cuticle Remover.—

Sodium hydroxide	¼ ounce
Glycerine	2½ fluidounces
Rose water	10 fluidounces

Dissolve the alkali in a solution of water and glycerine, filter, and keep the solution in rubber-stoppered bottles.

Nail Enamel.—

Acetone	400 fluidounces
Butyl acetate	300 fluidounces
Ethyl lactate	200 fluidounces
Dibutyl phthalate	100 fluidounces
Phenylethyl alcohol	½ fluidounce
Cellulose nitrate	25 ounces
Eosine (alcoholic solution)	Sufficient to give desired tint.

Dissolve the cellulose nitrate in a solution of acetone, butyl acetate, and ethyl lactate. Add the dibutyl phthalate and finally the phenylethyl alcohol and the color solution.

Caution:—When preparing the above formula be sure to have no flame near as some of the ingredients are very inflammable.

Nail Polish (Paste).—

White wax	8	ounces
Stearic acid	1½	ounces
Triethanolamine	5	ounces
Water	2½	gallons
Red alkanet	½	ounce

On a water bath heat together the stearic acid, water and triethanolamine until the stearic acid is melted. In a separate container melt the wax and add to it the alkanet red; then add this mixture to the first, remove from the bath and stir till cool.

Nail Polishes (Powdered).—Powdered nail polishes are made up essentially from finely powdered pure silica, kaolin or diatomaceous earth. French chalk and putty powder are also used, either alone or in combination with the above. They may be colored with iron oxides or with alkanet red and perfumed to suit.

A typical formula for such a polish is:

French chalk	12	pounds
Carmine	½	ounce
Oil of rose	½	ounce

Nail Softener.—To soften brittle nails rub them well with a cloth moistened with a 3 per cent solution of hydrogen peroxide and then rinse them thoroughly with water.

Nail Bleach.—Nails with ugly and unsightly spots may be bleached very effectively by treating them with the following solution:

Hydrogen peroxide (3 per cent)	5	fluidounces
Glycerine	1	fluidounce
Orange flower water	2	fluidounces

Dissolve the glycerine in the water and then add the hydrogen peroxide.

HAIR PREPARATIONS:

Quinine Water.—

Quinine sulphate	1	ounce
Rose water	6	pints
Glycerine	6	pints
Alcohol	8	gallons
Geraniol	1½	ounces
Linalool	3	ounces
Eugenol	5	ounces
Phenylethyl alcohol	2	ounces
Cinnamic alcohol	½	ounce
Balsam of Peru	50	grains

Dissolve the quinine sulphate in the water and add the glycerine. Dissolve the perfume ingredients in part of the alcohol and add to the quinine solution, stirring. Finally add the remainder of the alcohol.

Eau de Quinine.—

Quinine sulphate	75	grains
Tincture of cantharides	½	ounce
Glycerine	3	ounces
Rose water	8	ounces
Alcohol	24	ounces
Perfumed with a mixture of		
Geraniol	2	fluidounces
Citronellol	2	fluidounces
Phenylethyl alcohol	½	fluidounce
Color to suit.		

Dissolve the quinine sulphate in the alcohol, add the cantharides tincture. Mix the glycerine with the water and add to the alcoholic solution and finally add the perfume materials.

Hair Curling Preparation.—

I.—Gum tragacanth.	1	ounce
Glycerine	1	fluidounce
Rose water	15	fluidounces

Mix together. Hair is moistened with this solution and then rolled up in curlers.

II.—Eau de cologne	1	ounce
Rose water	8	ounces
Quince seed meal	⅛	ounce
Perfume to suit.		

Macerate the quince seed with boiling water, strain to a clear uniform solution then cool and add the other ingredients. This preparation can be used for waves or for moistening the hair to curl it.

Hair Bleach.—

Hydrogen peroxide 3 per cent	1 ounce
Ammonia water	10-15 drops

Mix into a paste with powdered henna. Apply to hair and leave for about 15 minutes. Then wash hair with peroxide and leave it for about 10 minutes after which rinse and dry.

Golden Tint for Hair.—The following is a shampoo preparation for tinting hair a golden hue.

Sodium bicarbonate	3	ounces
Powdered Egyptian henna	6	ounces
Powdered borax	3	ounces
Powdered white castile soap	10	ounces
Powdered sage	5	ounces
Pyrogallol	½	ounce
Powdered orris root	2	ounces

Mix powders well to get uniform mix-

ture and when ready to use moisten with water to form a lather with which the hair is well washed as for shampooing. Rinse with lukewarm water.

Hair Waving Lotion.—

Gum acacia	1 ounce
Orange-flower water	4 ounces

Mix into a uniform solution.

Permanent Wave Oil.—

Sodium hydroxide	2½ ounces
Borax	4 ounces
Purified turkey red oil	8 ounces
Strong ammonia water	15 ounces
Rose water	4 pints

Stay-comb Preparation or Waving Powder.—

Powdered gum arabic	8 parts
Sodium salicylate	1 part

Color and perfume to suit.

Incorporate the color and perfume with the salicylate and add to it the powdered gum arabic mixing thoroughly in a mortar until a uniform mixture is obtained. The product should be uniformly colored and if moist should be spread out to dry and then sifted through a fine sieve to obtain a uniform colored and fine powder. To use, this powder is dissolved in 1 gallon of water allowing to stand if necessary until a thoroughly uniform solution is obtained.

Castor Oil Pomade.—

Castor oil	4 fluidounces
Benzoated mutton tallow	2 ounces
Beeswax	¼ ounce
Oil of neroli	⅛ fluidounce
Oil of lilac	30 drops

Melt the waxes and fats together on a water bath, stir to uniformity, and while cooling add the perfume.

Brilliantine.—

Castor oil	1½ parts
Oil of almonds	1½ parts
Eau de cologne	4 parts

Solid Brilliantine.—

Paraffin	25 parts
Liquid petrolatum	40 parts
Spermaceti	8 parts
Petrolatum	15 parts

Perfume to suit.

Make uniform by melting together on a water bath and while cooling add the perfume.

Bronze Henna Shampoo.—

Powdered henna	2 tablespoonfuls
Borax	½ teaspoonful
Liquid bluing	½ teaspoonful

Stir the above ingredients in 2 cupfuls of hot water and strain. Shave a bar of castile soap into the mixture and warm in an enamled pan until smooth, taking care not to boil the mixture. Strain and shampoo the hair using warm water.

Soapless Shampoo.—

Saponine solution	1 ounce
Glycerine	5 pounds
Rose water	10 gallons

Make a saponine solution by dissolving 1 pound of the powdered saponine in 7 pounds of boiling water. Mix the quantity called for in the above formula with the other ingredients.

Depilatory Powder.—

Calcium sulphide	15 ounces
Zinc oxide	2 ounces
Starch	3 ounces

Mix thoroughly and perfume to suit.

Dandruff Cure.—

Salicylic acid	12 ounces
Castor oil	10 ounces
Carbolic acid	3 ounces
Eau de cologne	150 ounces

Dissolve the salicylic and carbolic acids in the cologne water and then stir in the castor oil. Apply several times a day.

To Help Grow Eyelashes.—Ointment of yellow oxide of mercury 1 per cent is helpful in encouraging the growth of eyelashes. This should be brushed on the lashes and brows each night with a tiny brush.

DENTIFRICES:

Mouth Wash.—

¼ teaspoonful table salt
¼ teaspoonful borax
1 teaspoonful hydrogen peroxide

Dissolve in a glass of warm water. This solution can be prepared daily for immediate use.

Tooth Wash.—

Tincture of soap bark	4 ounces
Tincture of rhatany	100 grains
Glycerine	1 ounce
Rose water	3 ounces
Essence of peppermint	20 drops
Essense of cloves	20 drops

Mix well.

Iodide Mouth Wash.—

Water	¾ ounce
Potassium iodide	2 grains
Sodium chloride	40 grains
Iodine	1 grain

Dissolve the potassium iodide in as little of the water as possible and add to this the iodine. When the iodine has completely dissolved add the remaining water in which has been dissolved the sodium chloride.

Toothpaste.—

Precipitated chalk	3 ounces
Powdered cuttlefish bone	3 ounces
Orris root (powdered)	1 ounce

Glycerine enough to make a paste. Add enough of oil of wintergreen and saccharine to give desired flavor.

Tooth Powder. (Good Cheap)—

Precipitated chalk	4 ounces
Magnesia	1 ounce
Gum camphor	50 grains
Borax	100 grains

This is good for teeth and gums. It also helps to purify and sweeten the breath.

To Clean False Teeth.—

Very finely powdered Italian pumic	1 pounds
Sodium bicarbonate	4 ounces
Powdered white soap	3 ounces
Precipitated chalk	4 ounces

This will clean and sweeten plates, remove stains and give fine satisfaction. To use shake some of the powder on the wet plate and brush with an ordinary toothbrush.

Powder to Remove Tartar.—

Lactic acid	1 ounce
Precipitated chalk	12 ounces

Flavor with methyl salicylate.

BREATH PERFUMES:

Breath Perfume.—

Extract of licorice	1 pound
Orris root powdered	½ ounce
Powdered sugar	8 ounces
Magnesium carbonate	1 ounce
Oil of cloves	30 grains
Oil of cinnamon	5 grains

Mix the oils well with the sugar, soften the extract with a little water and work the sugar until a uniform mixture is obtained. Roll into a thin sheet and cut into squares weighing about ½ ounce each.

Breath Perfume.—

Oil of peppermint	40 drops
Oil of lemon	30 drops
Oil of chamomile	20 drops
Oil of sage	20 grains
Vanilla	120 grains
Catechu	150 grains
Sugar	300 grains
Extract of licorice	4 ounces
Mucilage acacia	sufficient quantity to form a mass.

Mix the oils with the powdered ingredients, work with the licorice and finally with the mucilage till uniform.

MISCELLANEOUS:

Freckle Remover.—

Orange-flower water	10 ounces
Hydrochloric acid	1/10 ounce

Mix and apply to freckles several times a day with soft brush or cloth.

Beauty Facial Clay Pack.—

Fuller's earth	16 ounces
Beeswax	½ ounce
Anhydrous lanolin	4 ounces
Borax	1 ounce
Rose water	½ pint

Color with desired tint and perfume to suit.

Melt the wax together with the lanolin over a water bath, add to it the borax dissolved in the water and stir thoroughly. Lastly add the color dissolved in water and the perfume. Stir in, finally the Fuller's earth and work in a mortar or ointment mill until a perfect smooth mixture is obtained.

Face Bleach.—

Almond meal	1 part
Hydrogen peroxide 3 per cent	2 parts
Lemon juice	2 parts
Tincture of benzoin	10 drops

Mix together into a uniform solution. Use once a week spreading over face and arms.

Preparation for Pimples, Blackheads, Liver-spots, etc.—

Alcohol	3 ounces
Acetic acid U.S.P.	½ ounces
Gum benzoin	24 grains

Dissolve the benzoin in the alcohol and then add the acetic acid.

Corn Cure.—Apply glacial acetic acid with a camel's hair brush or with a glass rod, morning and night. Corns will disappear after a few days' treatment.

CELLOPHANE ADHESIVE:

"Methyl Cellosolve" (Ethylene Glycol Monomethyl Ether) is used for sealing cellophane and like materials. The "Methyl Cellosolve" may be applied with a moistener. The solvent softens the cellophane which is then passed over a hot plate which evaporates the "Methyl Cellosolve" and binds the surfaces together. The solvent does not stick to the plate and is more convenient to use than glue.

CEMENTS:

Linoleum.—Various formulas are used for cementing linoleum or other artificial flooring material to wood, steel or concrete. The raw materials used are numerous and many different formulas have been used.

I.—Rosin	1	part
Boiled linseed	2	parts
Ground Cork	½	part

Cook the rosin and linseed until uniform and mix in the ground cork. This gives an excellent adhesive for cementing to concrete floor.

II.—Asphalt (Residual-M. P. 160-180° F.)	8	parts
Varnolene	2	parts
Clay	10	parts
III.—Xylol	1	part
Naphtha	2	parts
Cumar	6	parts
Clay	6	parts

Dissolve the Cumar in the solvent then add the clay and mix thoroughly.

After the formula is applied, the solvent is allowed to evaporate before laying the linoleum.

Litharge Glycerine:—A cement suitable for luting, cementing and patching which is waterproof is made by mixing together equal parts by weight of 70 per cent glycerine and litharge, mixing into a uniform paste. The cement remains plastic for 10 minutes and sets to a hard mass in 3 hours. This cement contracts very little upon setting and resists a high temperature.

China.—First thoroughly clean the surfaces to be cemented. The cement is prepared by mixing equal parts of mastic varnish (made by dissolving mastic gum in methyl alcohol) and thick isinglass solution. Stir while hot and apply immediately.

COLLODION, FLEXIBLE:

The U. S. Pharmacopoeia (Tenth Revision) prescribes the following:

Camphor	20 grams
Castor oil	30 grams
Collodion, a sufficient quantity to make	1000 grams

Weigh in succession in a dry stoppered bottle. Shake until the camphor is dissolved. Keep in closed bottle in a cool place away from fire.

CONCRETE PAINT:

A good concrete paint may be made as follows:—

Coumarone resin	100 pounds
Boiled linseed oil	4 gallons
Coal-Tar naphtha	5 gallons
V. M. & P. naphtha	15 gallons
Add Cobalt driers	

Dissolve the coumarone in naphtha, add linseed oil and drier.

DEODORIZING KEROSENE OR BENZINE:

I.—Zinc chloride	2	ounces
Petrolatum	5	pints

Agitate thoroughly and then pour into a vessel containing quicklime. Mix completely, let settle and decant the kerosene.

II.—Calcium chloride	2	ounces
Petrolatum	6	pints

Add a little hydrochloric acid and leave the liquid over the calcium chloride until all the chlorine has been expelled. Decant.

Deodorizing and Discolorizing.—

I.—Kerosene	100	parts
Litharge	1½	parts
Potassium Hydroxide	9	parts
Water	20	parts

Mix and agitate with water in various proportions several times, allowing the water to settle and decanting.

There are on the market a number of perfumes which are intended to neutralize. These can be obtained from the leading perfumery houses and have been found to be very effective. Not only do they neutralize the color but also give a pleasant smell.

DRY CLEANING:

Specially prepared trichlorethylene and perchlorethylene are recent additions to the list of dry-cleaning fluids. The former is termed non-combustible and non-flammable at ordinary temperatures, while the latter as non-combustible and non-flammable. Trichlorethylene is used in operations where the

temperature does not exceed 80° F. The other is used in the "closed" systems. These fluids rapidly dissolve fats, oils, etc. and are more effective in removing water-soluble stains than many other cleaning solutions. They penetrate quickly, leave no odor and do not attack the metals commonly used in the manufacture of dry-cleaning machines. Because of the higher boiling points of these solvents the loss by evaporation is less; the diffusion loss is also lower than a host of other dry-cleaning agents. Trichlorethylene and perchlorethylene may be readily and inexpensively recovered by several means—filtration or distillation are among the most efficient.

DUSTPROOFING TENNIS COURTS:

Dustproofing of tennis courts, etc., may be accomplished by the use of calcium chloride (powder) which is sprinkled over the ground. The chloride acts as an absorber of moisture which permits the chemical to function as a road stabilizer.

ETCHING PASTE:

Ammonium Fluoride	14 grams
Water	6 cubic centimeters
Concentrated Sulphuric Acid	4 cubic centimeters

Mix with 10 grams of Barites.

Use a lead container for making this paste. A small asbestos brush is employed for applying the paste to the glass. Instead of barites, a mixture of dextrine and starch may be used together with the water and sulphuric acid to give a smooth paste which can easily be applied to make designs on glassware. The paste is permitted to remain on the glass for 5 minutes and then wiped off.

FLOOR DRESSING FOR MARBLE, TERRAZZO AND CONCRETE FLOORS:

A satisfactory treatment for filling and rendering impermeable marble, terrazzo and concrete floors may be attained by the application of a solution of 14 per cent paraffin and 86 per cent mineral spirits and applying to the floor. This coating penetrates the pores and does not discolor white marble to any objectionable extent. After the floor has been cleaned thoroughly the above solution is applied with a lamb's wool mop. The floor may be polished after the application of the last coat.

HAIR BLEACH, BLUE:

The addition of 1 part of aniline violet to 665 parts of water makes an effective bleach for bluing yellowish hair.

HAIR WAVE LOTIONS AND POWDERS:

Hair setting preparations are usually made up from vegetable mucilage in water together with a preservative and perfume. The gums used may be quince seed, karaya or tragacanth.

I.—	
Quince seed	20 parts
Water	950 parts
Preservative	1 part
Alcohol	5 parts
Perfume	to suit

The Persian quince seed should be used as it is considered to give the most mucilage per pound and also is clear water-white. Soak the quince seed in water warmed to 150° F. and allow to stand for 5 hours permitting to cool slowly. Stir and strain through cheesecloth. Then add the alcohol into which has been dissolved the preservative and perfume. For preservative, the methyl or ethyl ester of parahydroxybenzoic acid is preferred.

A powder may be made up as follows:

II.—	
Gum karaya	1000 parts
Preservative	50 parts
Color (water soluble)	to suit
Perfume	to suit
Alcohol	sufficient

Mix the gum and preservative till uniform and then incorporate the alcoholic solution of perfume and color. Allow the alcohol to evaporate.

JAVELLE WATER:

May be easily prepared by bubbling chlorine through a solution of caustic soda and soda ash.

I.—	
Chlorine	41.7 pounds
Caustic soda	48 pounds
Soda ash	16 pounds
Water	100 gallons

Permit the solution to cool before adding the chlorine. During chlorination it is advisable to keep the temperature of the solution below 86° F. The solution may be cooled by spraying cold water against the sides of the concrete or earthenware tank. This mixture will give a 5 per cent available chlorine bleach.

Javelle water may also be prepared from calcium hypochlorite and soda ash.

II.—Soda ash	6 pounds
Calicum hypochlorite	10 pounds
Water	9 gallons

This makes a bleach of 5 per cent sodium hypochlorite.

LACQUER FORMULATIONS:

Involving the Use of Glyceryl Phthalate Synthetic Resin.—The incorporation of glyceryl phthalate in a nitrocellulose lacquer gives high gloss and fullness; imparts adhesion, rubbing qualities and outdoor durability to a far greater extent than that of the original lacquer. High solid content lacquers may be formulated with the use of these resins. Top coatings for colored and metallic surfaces are furnished by these lacquers. They also produce wood finishes which are alcohol-resistant.

I.—Butanol	5 parts
Ethyl acetate	18 parts
Butyl acetate	12 parts
Xylol	25 parts
Toluol	18 parts
Dibutyl phthalate	4 parts
½ Sec. nitrocellulose	4-6 parts
Glyceryl phthalate	12-14 parts

The proportion of glyceryl phthalate used depends upon the hardness of the resin. Clear lacquers for automobiles, metals, hardware and silver may be compounded from the above formula.

Dibutyl phthalate is recommended as a plasticizer and pigments as well as filler may be included. Castor oil can be used in conjunction with dibutyl phthalate as a plasticizer. Mineral spirits are not recommended for this lacquer. Alcohol-resistant lacquers for bars, wood, etc. may be produced by the incorporation of these resins.

Chlorinated Diphenyl Lacquer.—A formula suitable for electric wire lacquer is the following:

I.—15-20 Sec. nitrocellulose	13 ounces
Tricresyl phosphate	12 ounces
Chlorinated diphenyl	7 ounces
Castor oil	1.7 ounces

The following solvent is used:

Ethyl acetate	10 ounces
Butyl acetate	25 ounces
Butanol	5 ounces
Toluol	40 ounces
Benzol	20 ounces

Phenolic Resin Solution Lacquer.—A lacquer which gives high gloss, good adhesion, water, oil and fat resistance may be compounded as follows:

Titanium dioxide	50 parts
100% Oil-soluble resin	75 parts
3 Sec. nitrocellulose and as solvent	50 parts
Ethyl acetate	25 parts
Butyl acetate	55 parts
Butanol	15 parts
Toluol	130 parts
Dibutyl phthalate	20 parts

Make a separate solution of the resin in Toluol. The nitrocellulose is dissolved in the solvents; mix the titanium dioxide with some of the nitrocellulose to form a paste. Incorporate the remainder of the nitrocellulose solution with the titanium dioxide paste, add the resin solution and the dibutyl phthalate. Stir until uniform, thin with Toluol if necessary. The above formula gives a white lacquer suitable for refrigerators, etc. where an easily polished surface is desired.

Vinyl Compounds Lacquers.—A suitable lacquer for coating cans which are used for containing beer and other food products is formulated from the synthetic resin obtained by the polymerization of the vinyl compounds such as vinyl chloride, acetate, chloro-acetate and the like. These resins are colorless, tasteless and odorless. They form tough, stable, highly adhesive and chemically resistant coatings upon incorporation with any cellulose ester. The vinyls are also compatible with nitrocellulose. Among their many desirable properties is their light-resistance. A formula for coating cans is the following:

I.—Acetone	60 parts
Toluol	40 parts

to which Vinyl resin is added in the amount necessary for desired consistency

Dibutyl Phthalate
(15% of resin content)

Cellulose Acetate Lacquer.—

Cellulose acetate	20 parts
Triphenylphosphate	8 parts
Chloroform	40 parts
Acetone	120 parts

to 25 parts of this solution is added:

Phenolic resin	30 parts
Amyl acetate	15 parts
Ethyl acetate	35 parts
Acetone	50 parts

This gives a clear lacquer suitable for baking. It is highly resistant to water, and may be used outdoors. If desired, pigments may be included for the purpose of giving color effects.

Baking Enamels.—Enamels designed for baking give high glossy finishes suitable for refrigerators, automobiles, etc. Glyceryl phthalate resins are dissolved in equal parts of coal-tar naphtha and mineral spirits. Pigments such as titanium oxide, toluidine toner and the like are incorporated by thorough grinding in a stone or pebble mill. It is to be noted that zinc oxide should be added very carefully and used only when prescribed by the expert lacquer formulator. A high bake finish is the following:

Glyceryl phthalate	5 pounds
Zinc oxide	2 pounds
Titanium oxide	25 pounds
Coal-tar naphtha	10 pounds
Mineral spirits	10 pounds
Toluol	5 pounds

Bake at 250° F. for 2 hours.

Many varieties of Glyceryl Phthalate resins are obtainable on the market; their properties are dependent on the fatty acid base used in the manufacture of said resin. Resins meeting any particular requirement can be had; the manufacturer can advise what resin to use.

Polymerized Acrylic Compounds.—Recently there has appeared on the market new resins which are characterized by their transparency, water-white color and resistance to discolorations. They have high adhesive properties and are resistant to mineral oils and chemicals; their elasticity is so great that they are comparable to rubber. Films of this material are capable of being stretched as much as ten times without breaking. They are very useful in coating rubber articles and other materials where flexibility is desired.

They can be compounded with nitrocellulose together with a plasticizer such as dibutyl phthalate using ethyl acetate as a solvent. If desired a pigment such as Titanium Oxide may be introduced.

Benzyl and Ethyl Cellulose.—New compounds from cellulose have been developed which have been found very useful in the formulation of lacquers. Benzyl and ethyl cellulose lacquers are characterized by their extreme flexibility, good adhesion, alkali, light and fire proofness.

A formula employing benzyl cellulose follows:

Benzyl cellulose	3¼ parts
Toluol	85 parts
Methyl cellosolve	15 parts
Dibutyl phthalate	½ parts

A formula using ethyl cellulose:

Ethyl cellulose	8 parts
Ethyl ortho benzoyl benzoate	8 parts
Toluol	50 parts
Butyl acetate	30 parts
Ethyl acetate	10 parts
Butyl Alcohol	10 parts

Lacquer Solvents.—The following list of solvents, arranged according to boiling points, should prove of value to the formulator who is interested in having a wide selection:

Methyl acetate	56-57° C.
Acetone	57
Methyl alcohol	65
Ethyl acetate (anhydrous)	77
Ethyl alcohol	78
Benzene	80
Isopropyl alcohol	82
Ethylene dichloride	84
Trichlorethylene	87
Ethyl propionate	98-102
Toluene	111
Butyl alcohol	117
Ethyl butyrate	121
Diethyl carbonate	125
Butyl acetate	125
Amyl alcohol	126-132
Cellosolve	135
Solvent naphtha	130-160
Amyl acetate	138-142
Xylene	143
Hi-flash naphtha	150-200
Ethyl lactate	155
Hexalin	160
Decalin	190
Tetralin	206

Lacquer Plasticizers.—The following is a list of plasticizers which are commonly employed in lacquers and should prove useful to the lacquer compounder. They are classified according to their boiling points:

Castor oil	—
Camphor (solid)	209° C.
Butyl stearate	220
Triacetin	258
Diethyl tartrate	280
Dimethyl phthalate	282
Diethyl phthalate	290
Dibutyl tartrate	300
Butyl ortho benzoyl benzoate	300
Triphenyl phosphate	320
Dibutyl phthalate	335
Diamyl phthalate	340
Tricresyl phosphate	350
Methyl ortho benzoyl benzoate	350
Tributyl phosphate	—

PAINT MIXING AND GRINDING.

As a general rule the ingredients of the paint to be made which consist of the various colors or pigments are mixed together with the linseed oil in a paste blade mixer which is elevated six or seven feet above the floor level and fastened securely on a strong platform. Steps lead up to this platform and the workman can get to the mixer at any time he chooses. The heavy cans or pails or tanks of raw materials are hoisted up to the mixer by the use of a pully arrangement. They are dumped in and thoroughly mixed.

Then the mixture is ready for grinding and the grinding mill is located on a floor just below the mixer so that the thick paste can be run through a funnel right into the mill below and be ground. Various kinds of mills are used by different manufacturers. There are the mills for paste grinding and those for liquid grinding, the latter being used for thinner paints and the former for thicker materials. Two types of mills are commonly used today, the Stone or sometimes called Burr Mill and the Pebble or Ball Mill.

The paint, whichever type of mill it is to be ground in must be very finely ground and samples can be taken from the mill from time to time to determine the smoothness. Using the palette or a knife one can spread a little on a clean piece of glass and allow it to dry and by feeling of it and looking at it one can readily determine how smooth the particles have been ground. It is important that the pigment be very smooth although for some cheap paints manufacturers are not nearly as particular as for good paints. Especially is this true when grinding a barn paint as compared with architectural enamel. The enamel must be ground finer than even any ordinary paint or the oil or varnish will not cover over the small unground particles.

There is still another type of mill to be mentioned and that is the Roller Mill. This mill is used for grinding exceedingly heavy pastes such as pigment pastes, putties, etc., although regular commercial putty is usually ground in what we call a putty chaser which really is not a grinding machine. Very thick pastes can be ground up in a Roller Mill.

Different pigments require different lengths of time in which to be ground for some are harder to crush than others. Experimentation by the mixer will soon teach him this. One pigment will require more oil to make up a paste than others. Different pigments have different oil absorption, consequently you might mix the same amount of oil with the same amount of both Zinc Oxide and Lithophone but you would find that you would have a nice smooth workable mass with the Zinc Oxide but with the Lithphone you have such a stiff paste that you could not work it at all. Because Lithophone absorbs more oil than Zinc Oxide.

HOUSE PAINTS.

House Paints should consist of the best materials that can be found but it is regrettable that the market is loaded with cheap, poor covering paints that will not give satisfaction. Since there is a demand for a cheap house paint we will give herewith a formula for one but always recommend the use of the high grade material. There is little doubt but that the old lead and oil combination is better than the factory prepared cheap paints but the guaranteed high grade machine ground and mixed house paint is better than the hand mixed lead and oil. It is impossible for one to thoroughly mix lead and oil by hand and do it as satisfactorily as it can be done in the mixing machine.

Highest Grade White Outside Paint.—

White Lead (Carbonate)	33 pounds
White Lead (Sulphate)	7 pounds
Zinc Oxide	26 pounds
Pure Linseed Oil	30 pounds
Turpentine	3 pounds
Drier	1 pound

Cheap Grade Outside White.—

White Lead (Carbonate)	25	pounds
Zinc Oxide	20	pounds
Calcium Carbonate	20	pounds
Blown Linseed Oil	25	pounds
V.M.P. Naptha	10	pounds
Drier	¾	pound

Inside White Gloss Paint.—

White Lead (ground in linseed Oil)	10	pounds
Zinc Oxide (ground in linseed Oil)	10	pounds
Pure Linseed Oil	1½	gals.
Turpentine	1½	gals.
Liquid Paint Drier	½	pint

Preparation of Mixed Paints.—The usual custom in factory practice is

to mix the pigments with the oil and grind same in a roller mill until the desired smoothness is obtained. A regular heavy duty mixer is employed after which the paste is run into the roller mill. Where the paint is thinner and not so thick, a stone or burr mill is quicker and more satisfactory as a paste paint oftentimes requires more than one grinding in a roller mill. After it is ground it may be reduced although in a thick paste paint all of the ingredients can be mixed together in the first place.

Colored Outside and Inside Paints.—(Tints) Simply grind the various pigment colors in linseed oil to obtain the so-called colors in oil. Then add the amount of color to the white that is necessary to produce the shade or tint required.

RED BARN PAINTS.

No. 1

Spanish Red Oxide	85 pounds
Magnesia Silicate	150 pounds
Linseed Oil	15 gallons

Mix the above ingredients together and then grind for as long a time until paint is smooth. This mixture may be too thick for satisfactory grinding and in such a case add a little V.M.P. Naptha until mixture is thin enough to grind. After it is finely ground add the following:

Improved Boiled Linseed Oil	4 gallons
Water Solution	4 gallons
Sipes Japan Oil	15 gallons
Camphor or Mineral Spirits	5 gallons

No. 2

Spanish Red Oxide	100 pounds
Calcium Carbonate	80 pounds
Magnesia Silicate	60 pounds
Linseed Oil	13 gallons

Thin the linseed oil down to Naptha, Varnolene or turpentine and then mix the above ingredients and grind in the paint mill. After they are ground add the following ingredients:

Improved Linseed Oil	24 gallons
Sipes Japan Oil	5 gallons
Naptha, V.M.P.	2½ gallons
Water Solution (free alkali)	5 gallons

1 to 2% Caustic in the water is plenty strong enough. Add the water solution after the 24 gallons of linseed oil has been added and not before.

RUST AND WEATHER PROOF PAINTS.

Many experiments have been made, trying to find a combination of materials that would produce a paint which would to a great degree withstand the salt air, a product that could be used on smoke stacks on the waterfronts, etc. Up to the present time the best known formulas for a paint to give the desired results and stand the exposure are as follows:

Black Paint

Asbestine 20	pounds
Red Lead 25	pounds
Black Lead 10	pounds
Blown Fish Oil 40	gallons
V. M. & P. Naptha... 20	gallons
Liquid Cobalt Drier .. ½	gallon

(more or less as required)

Dark Gray Paint

Asbestine 75	pounds
White Lead 90	pounds
Blue Lead 80	pounds
Zinc Oxide 10	pounds
Blown Fish Oil 150	gallons
Naptha or Mineral Spirits as desired 90	gallons
Liquid Cobalt Drier .. 1½	gallons

(more or less as required)

The pigments are mixed together and ground in a roller or stone mill until the necessary smoothness is obtained. As a rule the same smoothness is not required as in an house paint since this class of paint is used on outside, rough work. It is understood that the pigments are ground in the fish oil. More or less fish oil can be added or deducted as desired. Likewise with the thinner and drier. The formula is simply suggestive and since there is very wide range of requirements for paints of this type we merely give a tentative formula for same.

VARNISH AND OIL ENAMELS AND UNDERCOATS.

Light Amberol F-7 .. 23	pounds
Extra Light Amberol B S 1 26	pounds
China Wood Oil..... 18	gallons
Bodied Linseed Oil ... 6	gallons
Sugar of Lead 1¾	pounds
Liquid Cobalt Drier .. 1	quart
V.M.P. Naptha or Mineral Thinners ... 50	gallons

Into a gallon of this grind approximately 7 pounds of White Pigment consisting of 3 pounds highest grade Zinc